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APPLICATION FOR UNITED STATES PATENT

CORONA WIRE TENSIONING MECHANISM

INVENTORS: Daniel R. Palmer
Warren G. Branch, III
Gary B. Bertram

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BACKGROUND

The present invention is in the field of electrophotographic printers and copiers. More specifically this invention relates to the corona charging device used to charge the surface of a photoconductor.

The corona charging device usually contains one or more small diameter (e.g. .003 inch diameter) corona wires. It is important that these wires be properly tensioned. Excessive tension can result in wire breakage, whereas insufficient tension can result in wire vibration and subsequent non-uniform charging of the photoconductor. Additionally, corona wires have a finite life and must be replaced in the field.

It is common practice to spring load corona wires to achieve the proper tension. One method used to do this is to crimp lugs onto the ends of the wires, secure one end of the wires, and then insert the lugs on the other end through the hook of an extension spring. Multiple wires may then be tensioned by mounting these springs on a tensioner block and rotating and securing the tensioner block at the desired tension. One drawback of this method is that it is difficult to maintain engagement between the lugs and the springs while rotating and securing the tension block. Another drawback is that because the spring and the corona wire are in direct contact in this method, the spring is at the same voltage as the wire, and there is a risk of arcing by the spring. One further problem with this method is that the force of the spring hooks can impart side loads on the lugs, which in turn can impose undue stress on the wires.

A corona wire tensioning mechanism is desired which would allow individual replacement of the corona wires, which would not impart side loads on the wires, and which would easily maintain engagement between the wire and the tensioning mechanism and yet be isolated from the spring so as to minimize the danger of arcing by the spring.

SUMMARY OF THE INVENTION

A wire tensioning mechanism for tensioning a wire having an end one and an end two in a machine, wherein the wire has a means for attachment on end two and is fixed to the machine at end one, comprises a slide block, and a spring.

The slide block is slidably mounted to the machine at end two of the wire, such that the slide block slides parallel to the wire. The slide block has a slot which is wider than the wire but narrower than the means for attachment, such that when the slide block is mounted on the machine, the wire end two can be slid into the slot such that pulling the slide block in the direction away from the wire forces the means for attachment against the slot, but does not allow the means for attachment to pass through. The slot is lined up with the wire such that when the wire is in tension, there are no side loads on the means for attachment.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is an isometric view of a wire tensioning device according to an aspect of the invention.

FIGURE 2 is an isometric view of a wire tensioning device according to a further aspect of the invention.

FIGURE 3 is a side view of a wire tensioning device according to an aspect of the invention.

FIGURE 4 is a top view of a wire tensioning device, according to an aspect of the invention.

FIGURE 5 is a top view of a continuous corona wire configuration with a wire tensioning device according to an aspect of the invention.

DETAILED DESCRIPTION

. This invention discloses a means for spring loading the wire **6** without actually attaching the spring **40** to the wire **6**. This minimizes the risk of arcing from the spring **40** to the wire **6** and to other components within the machine. This improvement also minimizes side loads on the wire **6** by distributing the force on the attachment means **3**, such as a lug, all the way around the attachment means **3**.

Various aspects of the invention are presented in Figures 1-5 which are not drawn to scale and in which like components are numbered alike. Referring now to Figure 1 according to an aspect of the invention, a wire tensioning mechanism **2** for tensioning a wire **6** having an end one (not shown) and an end two **7** (see figures 2-3) in a machine **4** wherein the wire **6** has a means for attachment **3** on end two **7** and is fixed to the machine **4** at end one, comprises a slide block **30**, and a spring **40.**

The slide block **30** is slidably mounted to the machine **4** at end two **7** of the wire, such that the slide block **30** slides parallel to the wire **6**. The slide block **30** has a slot **35** which is wider than the wire **6** but narrower than the means for attachment **3,** such that when the slide block **30** is mounted on the machine **4,** the wire end two **7** can be slid into the slot **35** such that pulling the slide block **30** in the direction away from the wire **6** forces the means for attachment **3** against the slot **35**, but does not allow the means for attachment **3** to pass through. The slot **35** is lined up with the wire **6** such that when the wire **6** is in tension, there are no side loads on the means for attachment **3**. In a preferred embodiment, the means for attachment **3** is a lug crimped on the wire end two **7**.

In order to align the wire **6** to the desired direction, the machine **4** will often have grooves **8** where the wire must lay. In this case, the slide block **30** is preferably slightly offset from the groove **8** in order to register the wire **6** against the groove **8** such that the wire **6** doesn't move.

The spring **40** is mounted between the machine **4** and the slide block **30** such that the spring **40** exerts a force on the slide block **30** in the opposite direction of

the force which the tensioned wire **6** exerts on the slide block **30.** The force of the spring **40** can cause the slide block **30** to slide, and the spring **40** is chosen such that the force exerted on the slide block **30** causes the wire **6** to achieve the desired tension. Thus the spring **40** forces the slide block **30** to pull on the wire **6**.

Referring now to Figures 2-4, in a preferred embodiment of the invention, the wire tensioning mechanism **2** further comprises a holder **10** which is mounted to the machine **4**. In this embodiment, the slide block **30** is slidably mounted to the holder **10**. A preferred means of slidably mounting the slide block **30** to the holder **10** is to use a slide pin **20**, wherein the slide pin **20** is mounted to the holder **10**. A slide pin **20** may be mounted directly to the machine **4**, wherein the slide block **30** is slidably mounted to the machine **4** on the slide pin **20** (this configuration is not shown).

When a holder **10** is incorporated, the spring **40** may be mounted between the machine **4** and the slide block **30**, or between the holder **10** and the slide block **30** (this configuration not shown). The preferred embodiment is to have the spring **40** mounted between the slide block **30** and the holder **10**.

In a further preferred embodiment, the slide block **30** is v-shaped, and the v-shaped slide block **30** comprises a leg one **34** and a leg two **32** (this is best seen in Fig-3). Slide block leg one **34** is slidably mounted to the machine **4**, and leg two **32** is on the same side of leg one **34** as the wire **6** such that leg two **32** angles away from the wire **6.** Thus the "v" is laying on one of its sides (leg one **34**), and the slot **35** is in the other side of the "v" (leg two **32**). The portion of the slide block **30** with the slot **35** angles away from the wire **6** in order to better keep the wire **6** from slipping out of the slot **35**.

According to a further preferred embodiment, the spring **40** is a compression spring. Although a compression spring is preferred for space constraint reasons, a tension spring will also work.

In a typical electrophotographic machine, multiple corona wires are present.

Referring now to Figure 5, rather than have individual wires, according to a further aspect of the invention, a single continuous wire **6** may be used which would be strung in such a way as to create multiple segments. This continuous wire **6** would have an end one **5** and an end two **7**, wherein end one **5** is secured against movement and end two **7** has a lug **3** crimped on. Wherein the necessary bends in the wire are achieved by wrapping the wire **6** around restraining devices **50**, end two **7** is wrapped around the final restraining device **51** such that it makes an angle with the rest of the wire **6** of approximately 90°. End two **7** is then secured by a wire tensioning mechanism of the type described above. Many different types of restraining devices are acceptable; posts, pins, pulleys and grooves are all examples of restraining devices which may be used. However this invention is not limited to these specific examples, any device which acts to restrain the wire such that the wire may be bent into multiple segments may be used.